ENCLOSURE A
COMMENTS ON STORMWATER LOADING CALCULATION METHOD

Document Section	Editorial/Technical Comment	EPA Comment	LWG Issue and Current Status with EPA
Global	Editorial	Throughout document there are references to "first round" and "second round" of data. In future documents, all references to "first round" should be changed to "Round 3A" and "second round" to "Round 3B".	
Global	Editorial	There needs to be a discussion of assumptions used in this assessment (e.g., there is no correlation between activities conducted within a land use and stormwater loading).	
Global	Editorial	In the future, there needs to be a discussion of the uncertainty in this analysis.	
1.0, p.1	Editorial	In future documents, all data used for the study should be noted. Section 1.0 of this document only discusses Round 3A data. It is not until Section 3.0 that the Port of Portland's data is discusses, and Section 4.0 that the GE data is discussed.	
2.0, p.3	Editorial	The objective of the loading evaluation is to provide data to ***understand the source, fate and transport of upland stormwater discharges to the Willamette River***.	**LWG Issue:** Objective of LWG's stormwater program is to support risk assessment and to evaluate sediment recontamination in the FS, which incorporates fate and transport analysis. This data may also provide information to DEQ to help understand the source of the contamination, but Source Control of the uplands is a DEQ task, not an LWG task.
2.1, p.3 First Bullet	Editorial	Understand ***relative*** stormwater…	
2.1.2, p.4 pp. 1, sent. 1	Editorial	Stormwater ***solids*** discharges …	
2.1.2, p.4 pp. 2, sent. 1	Editorial	…estimates of stormwater ***solids*** loads…	

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2.2, p.5 pp. 2 (after bullets), sent. 2	Editorial	…estimating these ***model input*** loads…	
2.2, p.5	Editorial	It is unclear how stormwater loads will be used to help set sediment PRGs. Please elaborate.	
3.2, p.7 last pp, sent. 1	Editorial	…compounds that are ***suspected*** to be a risk driver…	
3.3, p.7	Editorial	This discussion is very confusing as written. For future documents, chemical lists should be limited to actual lists of chemical determined to be needed for each of four bullets with rational or citation to rational.	
4.0, p.9	Editorial	EPA does not agree that direct measurement of all outfalls would require an unreasonably large number of measurements or that there are practical constraints (other than time and resources). The purpose for using representative land-use samples in lieu of sampling every stormwater outfall was to determine generalized pollutant values for land uses. Because this data is being used to determine reasonable estimates of stormwater loads on aggregate to the whole site, rather than individual loads for purposes of source identification and control, it was determined that a reasonable subset of the total storm water outfalls could be sampled to represent various land uses and extrapolated to the whole site.	
4.1, p.9	Editorial	In future documents, reference that the GE sample collected was similar methodology to the FSP.	
4.1, p.9 1st bullet	Editorial	…within the overall drainage area ***to the Site***.	

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4.1, p.10 3rd subbullet	Editorial/Technical	Heavy industrial (***20*** locations***, includes non-unique data from 15 unique locations***) ***representing X percent of the overall drainage to the Site.*** Need to provide X in future reports.	
4.1, p.10 4th subbullet	Editorial	Light industrial (five locations) ***representing X percent of the overall drainage to the Site.*** Need to provide X in future reports.	
4.1, p.10 1st bullet	Editorial	…sources that ***were determined not to be representative of*** generalized land use measurements. ***The initial list of chemicals to be evaluated as unique for each of these sites is presented in Table X.***	
4.1, p.10 1st bullet	Editorial	Future documents should discuss St. Johns bridge and Schnitzer samples from Round 3A, as appropriate.	
4.2.1, p.11 last sent.	Editorial	In this case, the ***data*** may be converted to…	
4.2.2, p.11 pp.1	Editorial	It should be stated up front that for this analysis all unique industrial sites are heavy industrial land use.	
4.2.2, p.11 pp.1, sent. 2	Editorial/Technical	In future documents reflect that loading rates for unique sites will be associated with drainage area for the entire property for that upland site.	
4.2.2, p. 11 pp.2	Editorial	This paragraph is confusing and it is unclear what the "data reduction approach" is. It is believed that this is an attempt to discuss the recategorization of unique and heavy industrial land-use data. This paragraph should be deleted and add following sentence to end of first paragraph: ***Recategorization of unique and heavy industrial land-use data is discussed further in Section 5.3.***	
4.2.3, p.12	Editorial	In future documents indicate that this is discussed further in Section 7.1 (or equivalent section).	

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4.3, p.12	Editorial	Estimation of long-term loads does not only involve water samples, but sediment trap samples as well.	
4.3, p.12 pp.1, sent. 2	Editorial	…meet the objectives for the ***RI/FS because the intent is only to determine generalized pollutant values for land uses rather than to identify actual sources or conduct source tracing.***	
4.3, p.12 pp.1, last sent.	Technical	It is inappropriate to compare whole water loads and solids loads because the partitioning of chemicals between these media will result in vastly differing loading rates. Whole water loads should be primarily used for relative risk contributions and solids loads should be used primarily for risk to benthic organisms and recontamination purposes. Solids loads should be calculated from both the whole water data and the in-line sediment trap data and compared to determine the uncertainty of solids loads to the site. Whole water solids loads can be calculated either using literature values for Kp term or best possible estimates available from limited LWG/Port data on filtered/unfiltered data pairs.	**LWG Issue:** LWG stormwater tech team meeting agreement notes said that we would have some flexibility on how to use whole water loads vs. solids loads with regards to load analysis objectives (e.g., relative risk contributions, benthic organism risk, recontamination). **Current Status**: EPA indicated to insert the word "primarily" as noted to indicate that there is some flexibility on how these various load estimates are used.
4.3, p.12 last pp.	Editorial	In future documents, please elaborate on the tools that are commonly applied to watersheds in the absence of detailed stormwater chemical data and how they will be used to evaluate future changes in source control and land use at this Site.	
4.3.1, p.13	Editorial	It should be clarified in future documents that this is the method that is used for calculating water loading from whole water samples for the purpose of determining relative risk exposures in the water column.	
4.3.1.1, p.13	Editorial	Runoff volumes will be calculated ***for each river model cell (Figure 4.2) adjacent to the uplands*** using the City of Portland Bureau of Environmental Service's GRID model. Additionally, runoff volumes will be calculated for each ***upland property*** listed in Table 4-1...	

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Document Section	Editorial/Technical Comment	EPA Comment	LWG Issue and Current Status with EPA
4.3.1.2, p.13	Editorial	**4.3.1.2** ***Chemical Load*** ***Chemical water loads*** will be calculated by multiplying the ***measured*** chemical concentration… C_w = Measured concentration (µg/L) for land use or ***unique*** site V_{month} = Volume of discharge (L/month) from land use or ***unique*** site over a month	
4.3.2, p. 13	Editorial	It should be clarified in future documents that this is the method that is used for calculating solids loading from sediment trap data for the purpose of determining relative risk exposures for benthic organisms and recontamination analysis.	
4.3.2.1, p.13	Editorial	Runoff volumes will be calculated ***for each river model cell (Figure 4.2) adjacent to the uplands*** using the City of Portland Bureau of Environmental Service's GRID model. Additionally, runoff volumes will be calculated for each ***upland property*** listed in Table 4-1...	
4.3.2.2, p.14	Editorial	…order to relate chemical concentrations (mass of chemical per mass of ***solids***) measured in ***in-line sediment traps*** to stormwater ***solids*** loading to the Site. Total organic carbon (TOC) concentrations ***measured in the stormwater solids*** will be used to normalize the ***stormwater solids*** chemical concentrations and determine loads on an organic carbon (instead of TSS) basis. ***This will be done by multiplying the TOC in stormwater solids by the stormwater solids chemical concentration.*** Both TOC-based…	
4.3.2.2, p.14	Editorial	Need to explain in future documents the rational for looking at loading on an OC-normalized basis.	

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4.3.2.3, p.14	Editorial	**4.3.2.3** ***Chemical Loading*** ***Chemical solids loads*** will be calculated by multiplying the ***measured stormwater solids*** chemical concentrations (mass of chemical per mass of ***solids***)by the TSS (mass of ***suspended solids*** per volume of … C_s = Measured concentration (µg/kg) for land use or ***unique*** site TSS = Total suspended ***solids*** (kg/L) in stormwater measured for land use or ***unique*** site V_{month} = Volume of discharge (L/month) from land use or ***unique*** site over a month	
4.3.2, p.14	Editorial	Need discussion of calculating chemical loads from whole water samples using the following equation. $L_{S,W}=C_{S,W}*V$ $C_{S,W}=C_w*X_s$ $X_s=1 – [1/(1+Kp*TSS)]$ Kp(metals)=see above Kp(organics)=Koc*Xoc Koc= - 0.54 log Sw + 0.44 Xoc=1 – DOC/TOC $L_{S,W}$=Solids load from water data (ng/d) $C_{S,W}$=Concentration sorbate in solids (ng/L) X_s=Sorbed fraction Sw=water solubility of sorbate Xoc=mass fraction OC in solids C_w= Total whole water concentration (ng/L) V=Volume of discharge (L/month) from land use or unique site over a month	
5.0, p.15	Editorial	In the future, need to include discussion of whole water-based solids loading.	

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5.0, p.15 step 3	Editorial	3. ***Recategorization of Data*** (Section 5.3) – ***This section provides the process*** to evaluate Unique and Representative Heavy Industrial ***data on a chemical-specific basis*** to identify ***which data*** could be reclassified from Unique to Representative or from Representative to Unique.	
5.0, p.15 step 4	Editorial	…evaluated for the presence of outliers for each land use category…	
5.1, p.18 3rd line	Editorial	…be included ***in land use data sets*** as follows	
5.1, p.18 1st bullet, last sent.	Editorial	***Otherwise,*** the St. John's Bridge data ***will*** be combined with the major transportation data.	
5.1, p.18 2nd bullet	Editorial	In future documents need to discuss fate of this data.	
5.1, p.18 pp.2	Editorial	Remove "…and explained further in Section 5.3.1.1." since there is no section in this document.	
5.2, p.19	Editorial	Title should be "Handling of Duplicates and Replicates" since both are discussed in this section.	
5.2, p.19 pp.2, sent. 1	Editorial	Need to define "relatively consistent".	

Document Section	Editorial/Technical Comment	EPA Comment	LWG Issue and Current Status with EPA
5.2, p.19 pp.2 5.2.1 & 5.2.2	Technical	For all future analyses, the process for evaluating field duplicates and lab replicates should be as follows: • Compute relative percent difference (RPD) for each normal/duplicate and normal/replicate data pair. Relative percent difference (RPD) is a measure of precision, calculated by: RPD = [X1 - X2]/Xave x 100 where: X1 = concentration in normal sample; X2 = concentration in field duplicate or lab replicate; and Xave = average concentration = [(X1 + X2) / 2] If the RPD is greater than levels presented in Table 4.2 of the *Portland Harbor RI/FS Round 2 QAPP Round 3A Stormwater Sampling*, January 19, 2007, then the samples will be determined to undergo an outlier analysis as described in the next bullets. • For divergent samples, conduct further investigation with field and lab staff and notes to determine any reasons for divergence. Data pair or individual data point may be segregated from data set if a substantial reason (e.g., information that field or lab procedures likely impacted results) exists for divergence, depending on reason. This will require BPJ and a full discussion of rational shall be provided in any future documents.	

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		• If no substantial reason for divergence can be found, compare data pair to other data points in the corresponding land use category. If the data pair is found to be with the range of data for that land use, then average the duplicate or replicate results with the corresponding normal sample. If either data point in the data pair are outside the range of data points in the corresponding land use category, then segregate data pair from data set. Note: Segregated data may be used in uncertainty analysis and conclusions discussions.	
5.2, p.19 pp.2 5.2.1 & 5.2.2	Technical	In all future analyses, sediment trap duplicates shall be averaged due to the extremely limited data set. However, the analysis of divergent duplicates should still be conducted and the impact of those averaged data on the analysis should be evaluated and discussed.	
5.3, p.21	Editorial	The objective of this section is to evaluate the data for each land use to confirm that the data appropriately represents the land use.	
5.3.1, p.21 pp.1, sent.3	Editorial	…industrial sites were categorized as Unique ***for certain chemicals***, anticipating that ***this data*** would not be used in…	
5.3.1, p.21 pp.2	Editorial	…quantitative and qualitative (***e.g.,*** graphical) methods to evaluate ***on a chemical-specific basis*** whether the unique ***and*** heavy industrial ***data sets*** contain outliers that could be reassigned ***(e.g., unique to heavy industrial or heavy industrial to unique)***.	
5.3.1, p.21	Editorial	In all future documents, a discussion of the purpose for weighting the data set for each land use must be provided.	

Document Section	Editorial/Technical Comment	EPA Comment	LWG Issue and Current Status with EPA
5.3.1, p.21	Technical	For all future analyses, the process for evaluating land use data should be as follows: Method 1: Concentration loads • Enter data for land use into ProUCL 4.0, including ND. For data sets with NDs, ProUCL can create additional columns to store extrapolated values for NDs obtained using regression on order statistics (ROS). • Use ProUCL to conduct goodness-of-fit (GOF) tests to determine distribution of data. • Use ProUCL to conduct outlier tests. Outliers for heavy industrial land use will be recategorized as unique data if backed up by general information about the site activities and COI that would lead to such a conclusion. Outliers for other land uses will be retained in data set, but noted in conclusions discussion and uncertainty analysis. (This replaces discussion in Section 5.3.2) • Use ProUCL graphical displays to present histograms, Q-Q plots, and box plots. • Use ProUCL to present Summary Statistics and Estimates of Population Parameters for data set.	

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		Method 2: Weighted Loads • Use City Grid Model to determine flows for each sample event for each outfall. • Within a land use, sum flows for each sample [please note that this will be chemical dependent]. (For example, the Light Industrial Land Use has four sample locations: OF-M1, OF-M2, Basin D, and Basin T. OF-M1 had 4 sample events, OF-M2 had 3 sample events, Basin D had 4 sample events, and Basin T had 4 sample events. If chemical x was analyzed in all samples, then 15 flows would be summed.) • Within a land use, divide each flow event by the total flow from the previous step and multiply by the corresponding concentration. If the sample was ND, then multiply by the detection limit. • Enter data for land use into ProUCL 4.0, including ND. For data sets with NDs, ProUCL can create additional columns to store extrapolated values for NDs obtained using regression on order statistics (ROS). • Use ProUCL to conduct goodness-of-fit (GOF) tests to determine distribution of data. • Use ProUCL to conduct outlier tests. Outliers for heavy industrial land use will be recategorized as unique data if backed up by general information about the site activities and COI that would lead to such a conclusion. Outliers for other land uses will be retained in data set, but noted in conclusions discussion and uncertainty analysis. (This replaces discussion in Section 5.3.2) • Use ProUCL graphical displays to present histograms, Q-Q plots, and box plots. • Use ProUCL to present Summary Statistics and Estimates of Population Parameters for data set.	**LWG Issue:** Elements of this comment different than LWG meeting agreement notes including 1) not averaging samples by site before weighting and 2) using flows by event for weighting factor instead of one event for all sites. Also, the outlier step is out of correct sequence (we intend to do this before we do any weighting). **Current Status:** Not resolved. EPA proposes further discussion.

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		▪ Within a land use, conduct correlation analysis of flow and concentration to determine if correlation exists. If p<0.05, then correlation exists and supports using data range from weighted data set. If no correlation exists (p>0.05), then compare data range from concentration loads and weighted loads to determine if range of loads to be used as inputs to Hybrid Model should be modified. There should be a discussion supporting this decision.	**LWG Issue**: This was not in in LWG meeting agreements. Although some flexibility for use of weighted loads is provided, we are unclear what level or type discussion will convince EPA that weighted data are appropriate for use. **Current Status**: EPA will provide clarification on what would support this decision. Potential items mentioned during the call were a literature review that supports the weighted data approach and/or presents data from other sites that shows weighting is more accurate. Also, if weighted method turns out to be the most conservative estimate, EPA indicated a willingness to use it.

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5.3.3, p.22	Technical	The objective of this section is to review data categorized as Unique site data (see Table X) to determine if it should be recategorized as Heavy Industrial land use for each chemical. The recategorization analysis will be conducted using the whole water data and supported with the sediment trap data. Whole water and solids stormwater data for each chemical will always be placed in the same category (i.e., heavy industrial land use or unique site). Due to the limited data set for pesticides, sediment trap data will govern any reclassifications for pesticides. For all future analyses, the process for evaluating recategorization of unique and heavy industrial data should be as follows: • Compare each unique site's data for each chemical to heavy industrial land use data for corresponding chemical. • If all data for a chemical at a unique site fall within the range of data for the heavy industrial land use, then recategorize data. If unique site data is outside the range of the heavy industrial land use data on either the high end or low end, or both, then the site remains unique. • Ensure that decision to recategorize data is backed up by general information about the site activities and COI that would lead to such a conclusion.	
5.3.4, p.28	Technical	In the future, do not conduct reclassification evaluations in this section.	
5.4, p.30	Technical	In the future, do not conduct the detailed outlier analysis in this section.	
5.6, p.34	Technical	In the future, do not conduct the evaluation in this section since it is redundant with Section 5.3.1.	
5.7, p.37	Technical	In the future, use ProUCL to present Summary Statistics and Estimates of Population Parameters for data set (see comment for Section 5.3.1).	

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6.1, p.41	Editorial	It should be noted in future documents that there is uncertainty in the TSS data that could be due to the various BMPs for solids control throughout the site.	
6.1.1.2, p.42 pp.1	Technical	Remove last two sentences in this paragraph. It is inappropriate to determine data is an outlier using data collected outside of this analysis because the data was not collected for the same purposes, within the same location (i.e., within the Site), or using the same methodology. The process presented for Section 5.3.1 provides the appropriate methodology to use to determine outliers for TSS data. It is acceptable to compare TSS data collected from this project with TSS data collected outside this project as a discussion in the uncertainty section.	
6.2, p.42	Technical	The in-line solids data set for each land use is too small to determine outliers or distribution on a quantitative (or statistical) basis. A qualitative analysis for outliers may be conducted.	
6.4, p.43	Technical	The TSS data measured in water and the TOC data measure in solids will be used to determine solids loading. Additionally, TOC in water should be used to calculate an OC normalized load.	
6.4, p.43 pp.1, sent.1	Editorial	***Stormwater solids*** loading to the Site…	
6.4, p.43 pp.1, sent.4	Editorial	…each case, the chemical concentrations in the sediment trap (either bulk ***solids*** or on…	

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6.4, p.43 pp.2	Technical	Delete last two sentences; there has not been enough study of these basins or other basins with the Site to determine TSS and concentration correlation, how likely maximum values occur simultaneously, or whether the data collected is in fact the maximum values that are likely to occur at the Site. Other studies have shown that there is no correlation between TSS and concentration. For the purposes of this analysis, it would be best to look at central tendency and worst case scenarios. Further, each sediment trap is a central tendency for that stormwater basin; thus, it would be appropriate to use the central tendency of TSS data from that basin for the analysis (i.e., take averages of TSS for each basin and then run statistics on the resulting values for land use loading calculations). It is appropriate to discuss the uncertainty in the range of estimates to ensure that these values are used appropriately in the Hybrid Model.	
7.0, p.44 pp.1	Editorial	…comparison of stormwater ***solids*** loading concentrations…	
7.1, p.44	Editorial/Technical	This section is acceptable for discussion of stormwater loads, but future analyses need additional section for discussion of stormwater solids loads. There should be a comparison of stormwater solids load calculated from whole water data, stormwater solids load calculated from sediment trap data with comparable mixed use basin solids loads.	
7.1, p.44	Technical	In the future, this comparison should be conducted for range of data points (e.g., minimum, average and maximum) to have enough information to determine if the land use extrapolation method is within the realm of loads calculated for mixed-use basins.	
7.2, p.45	Technical	In the future, do not conduct the detailed analysis in this section.	

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Table 3-1	Editorial	In the future, present two tables; one for whole water and another for solids since the analytes measured for each media were not the same due to sample size.	
Table 3-2 footnote 3	Editorial	…the fact that the bridge was recently ***repaved and repaired***.	

Table X. Initial List of Chemicals and Unique Sites[1]

Outfall #	Facility/Location	Chemicals
WR-22	OSM	PCBs, PAHs, metals
WR-123	Schnitzer International Slip	PCBs, phthalates, metals
WR-384	Schnitzer - Riverside	Metals, PCBs
WR-107	GASCO	PAHs
WR-96	Arkema	Pesticides
WR-14	Chevron - Transportation	PAHs
WR-161	Portland Shipyard	PAHs, phthalates, metals, PCBs
WR-4	Sulzer Pump	PAHs, metals, PCBs
WR-145	Gunderson	PCBs, PAHs, phthalates, metals
WR-147/148	Gunderson (former Schnitzer)	PCBs, phthalates, metals, PAHs
	GE	PCBs
WR-183/Basin R	Terminal 4 – Slip 1	PAHs, TOC
WR-181/Basin Q	Terminal 4 – Slip 1	Metals, PAHs, TOC
WR-177/Basin M	Terminal 4 – Slip 1	Metals, PAHs
WR-169/Basin D	Terminal 4	Metals, PAHs
WR-20/Basin L	Terminal 4 – Wheeler Bay	PAHs
OF-22B	City – Doane Lake Industrial Area	Pesticides, metals
St. John's Bridge	Highway 30	PCBs, others (bridge repaving activity)

Note 1: The chemicals listed for each site in this table represents those chemicals that were initially thought to be unique chemicals for the site (i.e., the data set will fall outside the range of the heavy industrial land use), but will be evaluated in the stormwater loading process to determine if they are appropriately classified (i.e., unique vs. non-unique). The draft RI Report will identify the final list of

sites and chemicals determined to be Unique.